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**UTILITY  
PATENT APPLICATION  
TRANSMITTAL**

Attorney Docket No. 1204US  
First Inventor David Drell  
Title Videoconferencing Apparatus

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Express Mail Label A

EL666126127US

**APPLICATION ELEMENTS**

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ Fee Transmittal Form (e.g., PTO/SB/17)  
(Submit an original and a duplicate for fee processing)
2. ☐ Applicant claims small entity status.  
See 37 CFR 1.27.
3. ☒ Specification [Total Pages 26]  
(preferred arrangement set forth below)
- Descriptive title of the invention
  - Cross Reference to Related Applications
  - Statement Regarding Fed sponsored R & D
  - Reference to sequence listing, a table, or a computer program listing appendix
  - Background of the Invention
  - Brief Summary of the Invention
  - Brief Description of the Drawings (if filed)
  - Detailed Description
  - Claim(s)
  - Abstract of the Disclosure
4. ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 5]
5. Oath or Declaration [Total Pages ]
- a. ☐ Newly executed (original or copy)
- b. ☐ Copy from a prior application (37 CFR 1.63 (d))  
(for continuation/divisional with Box 17 completed)
- i. ☐ **DELETION OF INVENTOR(S)**  
Signed statement attached deleting inventor(s)  
named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. ☐ Application Data Sheet. See 37 CFR 1.76

ADDRESS TO: Box Patent Application  
Washington, DC 20231

7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)
8. Nucleotide and/or Amino Acid Sequence Submission  
(if applicable, all necessary)
- a. ☐ Computer Readable Form (CRF)
- b. Specification Sequence Listing on:
- i. ☐ CD-ROM or CD-R (2 copies); or
- ii. ☐ paper
- c. ☐ Statements verifying identity of above copies

**ACCOMPANYING APPLICATION PARTS**

9. ☐ Assignment Papers (cover sheet & document(s))
10. ☐ 37 CFR 3.73(b) Statement of Power of Attorney  
(when there is an assignee)
11. ☐ English Translation Document (if applicable)
12. ☐ Information Disclosure Statement (IDS)/PTO-1449
13. ☐ Preliminary Amendment
14. ☒ Return Receipt Postcard (MPEP 503)  
(Should be specifically itemized)
15. ☐ Certified Copy of Priority Document(s)  
(if foreign priority is claimed)
16. ☐ Other: .....

17. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:

☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP)

of prior application No.: .....

Prior application information.

Examiner

Group / Art Unit.

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

**18. CORRESPONDENCE ADDRESS**☐ Customer Number or Bar Code Labelor ☐ Correspondence address below

Name

22830

Address

PATENT TRADEMARK OFFICE

City

State

Zip Code

Country

Telephone

Fax

Name (Print/Type)

Douglas E. Mackenzie

Registration No. (Attorney/Agent)

38,955

Signature

Date 10/5/2000

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**FEE TRANSMITTAL  
for FY 2000**

Patent fees are subject to annual revision.

**TOTAL AMOUNT OF PAYMENT** (\$ 710.00**Complete if Known**

Application Number	unknown
Filing Date	10/5/2000
First Named Inventor	David Drell
Examiner Name	
Group Art Unit	
Attorney Docket No.	1204US

**METHOD OF PAYMENT (check one)**

- 1.
- ☒
- The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to:

Deposit Account Number	06-0600
Deposit Account Name	

- ☒
- Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17

☐ Applicant claims small entity status. See 37 CFR 1.27

- 2.
- ☒
- Payment Enclosed:**

☒ Check ☐ Credit card ☐ Money Order ☐ Other**FEE CALCULATION****1. BASIC FILING FEE**

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
101	690	201	345	Utility filing fee	710.00
106	310	206	155	Design filing fee	
107	480	207	240	Plant filing fee	
108	690	208	345	Reissue filing fee	
114	150	214	75	Provisional filing fee	

**SUBTOTAL (1)** (\$ 710.00**2. EXTRA CLAIM FEES**

Total Claims		Extra Claims		Fee from below		Fee Paid	
Independent	12	-20** =		X		=	
Multiple Dependent	2	-3** =		X		=	

\*\*or number previously paid, if greater; For Reissues, see below

Large Entity		Small Entity		Fee Description
Fee Code	Fee (\$)	Fee Code	Fee (\$)	
103	18	203	9	Claims in excess of 20
102	78	202	39	Independent claims in excess of 3
104	260	204	130	Multiple dependent claim, if not paid
109	78	209	39	** Reissue independent claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent

**SUBTOTAL (2)** (\$ )**FEE CALCULATION (continued)****3. ADDITIONAL FEES**

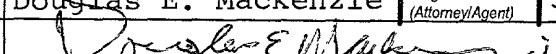
Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for <i>ex parte</i> reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	380	216	190	Extension for reply within second month	
117	870	217	435	Extension for reply within third month	
118	1,360	218	680	Extension for reply within fourth month	
128	1,850	228	925	Extension for reply within fifth month	
119	300	219	150	Notice of Appeal	
120	300	220	150	Filing a brief in support of an appeal	
121	260	221	130	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,210	241	605	Petition to revive - unintentional	
142	1,210	242	605	Utility issue fee (or reissue)	
143	430	243	215	Design issue fee	
144	580	244	290	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	690	246	345	Filing a submission after final rejection (37 CFR § 1.129(a))	
149	690	249	345	For each additional invention to be examined (37 CFR § 1.129(b))	
179	690	279	345	Request for Continued Examination (RCE)	
169	900	169	900	Request for expedited examination of a design application	

Other fee (specify) \_\_\_\_\_

\* Reduced by Basic Filing Fee Paid

**SUBTOTAL (3)** (\$ )**SUBMITTED BY**

Complete (if applicable)

Name (Print/Type)	Douglas E. Mackenzie	Registration No (Attorney/Agent)	38,955	Telephone	650-812-3400
Signature		Date	10/5/2000		

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1                   VIDEOCONFERENCING APPARATUS HAVING INTEGRATED  
2                   MULTI-POINT CONFERENCE CAPABILITIES

3  
4           Cross Reference to Related Applications

5           The present invention claims priority from U.S.  
6           Provisional Patent Application Ser. No. 60/157,711 filed on  
7           October 5, 1999, the entire disclosure of which is  
8           incorporated herein by reference.

9  
10                   BACKGROUND OF THE INVENTION

11    1.   Field of the Invention

12           The present invention relates generally to  
13           conferencing systems, and more particularly to a  
14           videoconferencing apparatus for use with multi-point  
15           conferences.

16  
17    2.   Background of the Prior Art

18           Videoconferencing systems have become an increasingly  
19           popular and valuable business communications tool. These  
20           systems facilitate rich and natural communication between  
21           persons or groups of persons located remotely from each  
22           other, and reduce the need for expensive and time-consuming  
23           business travel.

1       At times, it may be desirable to conduct multi-point  
2   conferences, wherein three or more parties (each party  
3   consisting of an individual or group located at a  
4   particular conference endpoint) participate in the  
5   conference. Multi-point conferences are particularly  
6   useful in situations where several interested parties need  
7   to participate in the resolution of an issue, or where  
8   information is to be disseminated on an enterprise-wide  
9   level. However, commercially available video conferencing  
10   systems are generally capable of communicating with only  
11   one other conference endpoint at a time. To conduct multi-  
12   point conferences, the conference endpoints are  
13   conventionally interconnected through an external piece of  
14   equipment called a multi-point control unit (MCU). The MCU  
15   is provided with multiple ports for receiving signals  
16   representative of audio and video information generated at  
17   each of the conference endpoints. The received signals are  
18   mixed and/or switched as appropriate, and the  
19   mixed/switched signals are subsequently transmitted to each  
20   of the conference endpoints.

21       A significant disadvantage associated with the use of  
22   MCUs is their expense. An enterprise wishing to conduct  
23   multi-point conferences must either purchase a MCU, which  
24   may cost upwards of \$50,000, or contract for "video bridge"

1 services through a telephone company, wherein an MCU  
2 located at the telephone company's facilities is rented on  
3 a fee per unit of usage basis. In either case, the high  
4 cost of purchasing or renting an MCU may dissuade a company  
5 from conducting multi-point conferences, even when it would  
6 be useful to do so.

7 Conventional MCUs further require a dedicated Inverse  
8 Multiplexer (IMUX) for each endpoint of a multi-point  
9 conference. These dedicated IMUXs are hardware devices  
10 which must be purchased and installed at additional cost to  
11 achieve increased endpoint capability.

12 Finally, conventional MCUs include hard-wired  
13 processing units each having a dedicated set of channels  
14 associated therewith. Thus, unused channels associated  
15 with a processing unit are unavailable for allocation to  
16 additional endpoints.

17 What is therefore needed in the art is a relatively  
18 low-cost videoconferencing apparatus which can dynamically  
19 allocate unused channels on an as needed basis.

1

2

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18

1 combines signal streams (representative of a single  
2 conference endpoint) distributed over two or more channels  
3 into a single, relatively high bandwidth channel. The  
4 communication process, which may for example comprise an  
5 H.320 process (ISDN-based) or H.323 (packet-based) process,  
6 separates the signal stream into audio and video signals,  
7 and performs certain processing operations (such as delay  
8 compensation) associated therewith. The audio and video  
9 signals are thereafter respectively delivered to audio and  
10 video codecs for decoding.

11 The decoded audio and video streams output by each of  
12 the processing trains, together with the locally generated  
13 audio and video signals, are combined at an audio mixer and  
14 a video switching/continuous presence module. The video  
15 module may be configured to selectively generate as output  
16 video data representative of a composite or continuous  
17 presence image, wherein video information (e.g., images of  
18 the conference participants) corresponding to each of the  
19 conference endpoints is displayed in different sectors of  
20 the screen. The combined audio and video data streams are  
21 conveyed as input to each processing train for encoding and  
22 transmission to the corresponding conference endpoints. In  
23 the send mode, the audio and video signals are encoded by  
24 the audio/video codecs and multiplexed into a single data

1 stream by the communication process. The combined  
2 audio/video data stream is then conveyed to the IMUX  
3 function, which distributes the combined audio/video data  
4 stream over the channels associated with the selected  
5 remote conference endpoint.



1                    BRIEF DESCRIPTION OF THE FIGURES

2            FIG. 1 depicts a near videoconferencing endpoint  
3    interconnected with two remote videoconferencing endpoints,  
4    the near videoconferencing endpoint having integrated  
5    multi-point conferencing capabilities;

6            FIG. 2 is a block diagram of the near conferencing  
7    endpoint;

8            FIG. 3 is a block diagram of a multi-point  
9    conferencing application of FIG. 2;

10           FIG. 4 is a block diagram of an exemplary signal  
11    processing train of FIG. 3; and

12           FIG. 5 is a block diagram of an exemplary network  
13    interface.

1           DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

2           FIG. 1 depicts an exemplary operating environment of  
3   the multi-point (MP) conferencing application of the  
4   present invention. A near conference endpoint 100,  
5   embodying the MP conferencing application, is coupled to  
6   remote conference endpoints 102 and 104 via a network 106.  
7   Remote conference endpoints 102 and 104 may comprise, for  
8   example, conventional videoconferencing devices equipped to  
9   transmit and receive both video (image) data and audio  
10   (speech) data. Alternatively, one or more of remote  
11   conference endpoints 102 and 104 may comprise conventional  
12   audio conferencing devices limited to reception and  
13   transmission of audio data. It should be appreciated that  
14   while only two remote conference endpoints are depicted in  
15   FIG.1 for the purpose of clarity, a greater number of  
16   remote conference endpoints may be accommodated by near  
17   conference endpoint 100.

18          Network 106 may be of any type suitable for the  
19   transmission of audio and video data between and among near  
20   conference endpoint 100 and remote conference endpoints 102  
21   and 104. Typically, network 106 will comprise the public  
22   switched telephone network (PSTN) or comparable circuit  
23   switched network to which each of the conference endpoints  
24   is connected by one or more ISDN lines. A multi-point

1 conference is initiated by establishing a connection  
2 between near conference endpoint 100 and remote conference  
3 endpoint 102, and between near conference endpoint 100 and  
4 remote conference endpoint 104. Establishment of the  
5 connections may be effected through a dial-up procedure, or  
6 through use of a dedicated line.

7 Alternatively, network 106 may comprise a packet  
8 switched network, such as the Internet. Although a single  
9 network 106 is shown, the invention contemplates the use of  
10 two or more networks (for example, the PSTN and the  
11 Internet) to connect conference endpoints utilizing  
12 different communication protocols.

13 Reference is now directed to FIG. 2, which depicts in  
14 block form various components of near conference endpoint  
15 100. A conventional video camera 202 and microphone 204  
16 are operative to generate video and audio signals  
17 representative of the images and speech of the near  
18 conference participant (the person or persons co-located  
19 with near videoconference endpoint 100). A video monitor  
20 208 and loudspeaker 210 present images and speech of the  
21 remote conference participants combined with locally  
22 generated images and speech. An audio I/O interface 212,  
23 configured to perform A/D and D/A conversion and related  
24 processing of audio signals, couples microphone 204 and

1 loudspeaker 210 to CPU 220 and memory 222 through bus 226.  
2 Similarly, video camera 202 and monitor 208 are coupled to  
3 console electronics 213 through video I/O interface 214.

4 Console electronics 213 additionally include a central  
5 processing unit (CPU) 220 for executing program  
6 instructions, a memory 222 for storing applications, data,  
7 and other information, and a network interface 224 for  
8 connecting near conference endpoint 100 to network 106.  
9 Memory 222 may variously comprise one or a combination of  
10 volatile or non-volatile memories, such as random access  
11 memory (RAM), read-only memory (ROM), programmable ROM  
12 (PROM), or non-volatile storage media such as hard disks or  
13 CD-ROMs. At least one bus 226 interconnects the components  
14 of console electronics 213.

15 Network interface 224 is provided with a plurality of  
16 ports for physically coupling near conference endpoint 100  
17 to a corresponding plurality of ISDN lines 240-246 or  
18 similar transmission media. The number of ports will be  
19 determined by the types of connections to network 106, the  
20 maximum number of remote conference endpoints which may be  
21 accommodated by videoconference endpoint 100, and the  
22 required or desired bandwidth per endpoint connection.  
23 Depending on bandwidth requirements, data communicated  
24 between near conference endpoint 100 and a remote

1 conference endpoint may be carried on a single ISDN line,  
2 or may be distributed (for higher bandwidth connections)  
3 among a plurality of ISDN lines.

4       Stored within memory 222 are an operating system 230,  
5 a call manager application 232, and the MP conferencing  
6 application 234. Operating system 230 controls the  
7 allocation and usage of hardware resources, such as CPU 220  
8 and memory 222. Call manager application 232 controls the  
9 establishment and termination of connections between near  
10 conferencing endpoint 100 and remote conference endpoints  
11 102 and 104, and may also furnish information  
12 characterizing the nature of individual connections to MP  
13 conferencing application 234.

14       As will be described in further detail below, MP  
15 conferencing application 234 is configured to instantiate a  
16 processing train for each remote conference endpoint 102  
17 and 104 to which near conference endpoint 100 is connected.  
18 The processing trains process audio and video data streams  
19 received from remote conferencing endpoints 102 and 104.  
20 The processed audio and video data streams are combined  
21 with each other and with locally generated audio and video  
22 streams, and the combined audio and video streams are  
23 thereafter distributed to remote conferencing endpoints 102  
24 and 104.

1           FIG. 3 is a block diagram showing the various  
2 components of an embodiment of MP conferencing application  
3 234 and the flow of data between and among the various  
4 components. MP conferencing application 234 includes a  
5 circuit switch 350, a plurality of processing trains 302  
6 and 304, a video switching/continuous presence module 306,  
7 and an audio mixing module 308. The circuit switch 350  
8 dynamically instantiates a number of high bandwidth  
9 processing trains equal to the number of remote conference  
10 endpoints to which near conference endpoint 100 is  
11 connected and preferably includes an dynamically created  
12 IMUX allocated to each remote conference endpoint. Each  
13 IMUX preferably utilizes a bonding protocol. In the  
14 example depicted in the figures, the circuit switch 350  
15 dynamically allocates two IMUXs and generates two  
16 processing trains 302 and 304 respectively corresponding to  
17 remote conference endpoints 102 and 104.

18           Processing trains 302 and 304 preferably comprise  
19 software routines which process received and transmitted  
20 audio and video signals in accordance with predetermined  
21 algorithms. In the receive mode, processing train 302 is  
22 instantiated by circuit switch 350 to include signals  
23 representative of audio and video data transmitted by  
24 remote conference endpoint 102. Illustratively, remote

1 conference endpoint 102 may transmit signals on ISDN lines,  
2 each ISDN line comprising two distinct 64 Kb/sec bi-  
3 directional channels ("Bearer channels"). Those skilled in  
4 the art will recognize that a smaller or greater number of  
5 ISDN lines may be utilized for communication with remote  
6 conference endpoint 102. As will be described in  
7 connection with FIG. 4, processing train 302 is operative  
8 to extract and decode audio and video data from signals  
9 received from remote conference endpoint 102. Decoded  
10 audio data is conveyed to audio mixing module 308 over  
11 audio data path 352, and decoded video data is conveyed to  
12 video switching/continuous presence module 306 over video  
13 data path 354.

14 Processing train 304 similarly receives audio and  
15 video data transmitted by remote conference endpoint 104.  
16 Processing train 304 extracts and decodes the audio and  
17 video data and subsequently passes the decoded audio and  
18 video data to audio mixing module 308 and video  
19 switching/continuous presence module 306 over audio and  
20 video data paths 370 and 372.

21 Audio mixing module 308 is configured to combine audio  
22 data received from remote conference endpoints 102 and 104  
23 with locally generated audio data (received from audio I/O  
24 interface 212 via audio data path 374, and typically being

1 representative of the speech of the near conference  
2 participant(s)). The term "combine" is used in its  
3 broadest and most general sense and is intended to cover  
4 any operation wherein audio mixing module 308 generates an  
5 output audio data stream (or plurality of output audio data  
6 streams) based on information contained in the remotely and  
7 locally generated audio data input streams. For example,  
8 audio mixing module 308 may simply mix the received audio  
9 input data streams, or it may be configured as an audio  
10 switch wherein it selects one of the received audio input  
11 data streams for output in accordance with predetermined  
12 criteria. The output audio data stream is directed to  
13 processing trains 302 and 304 and audio I/O interface 212  
14 along output audio paths 376, 378 and 380.

15 Video switching/continuous presence module 306  
16 combines video data received from remote conference  
17 endpoints 102 and 104 with locally generated video data  
18 (received from video I/O interface 214 via video data path  
19 382, and being typically representative of images of the  
20 near conference participants). Again, the term "combine"  
21 is used in its broadest and most general sense. In one  
22 mode of operation, video switching/continuous presence  
23 module 306 may select one of the video data input streams  
24 for output based on predetermined criteria (for example, it



1 may select for output the video data stream corresponding  
2 to the conference endpoint of the currently speaking  
3 participants. In a second mode of operation (referred to  
4 as the "continuous presence mode"), video  
5 switching/continuous presence module 306 may construct a  
6 composite image wherein images corresponding to conference  
7 endpoints are displayed in different sectors of the  
8 composite image. The video data stream output (or  
9 plurality of outputs) from video switching continuous  
10 presence module 306 is thereafter distributed to processing  
11 trains 302 and 304 and video I/O interface 214 via video  
12 data paths 390, 392 and 394.

13 In the transmission mode, processing train 302 is  
14 configured to receive the audio and video data streams  
15 output by audio mixing module 308 and video  
16 switching/continuous presence module 306. The received  
17 data streams are then encoded and combined to form a mixed  
18 encoded audio/video data stream, and the encoded  
19 audio/video data stream is transmitted to the circuit  
20 switch 350 via data path 344. Similarly, processing train  
21 304 receives the audio and video streams output by audio  
22 mixing module 308 and video switching/continuous presence  
23 module 306, encodes and combines the audio and video data  
24 streams, and transmits the encoded audio/video data stream

1 to the circuit switch 350 via data path 346. For each  
2 encoded audio/video data stream, the circuit switch 350  
3 allocates an IMUX which aggregates the data streams into a  
4 wideband data stream on the bus 226, preferably utilizing a  
5 bonding protocol.

6 FIG. 4 depicts components of an exemplary processing  
7 train 302. Processing train 302 includes a communication  
8 process 404 and video and audio codecs 406 and 408. In the  
9 receive mode, the combined data stream 344 is directed to  
10 communication process 404 which carries out a predetermined  
11 set of functions with respect to data stream 344.

12 According to one embodiment of the invention,  
13 communication process 404 implements the multiplexing,  
14 delay compensation and signaling functions set forth in ITU  
15 Recommendation H.320 ("Narrow-Band Visual Telephone Systems  
16 and Terminal Equipment"). In particular, communication  
17 process 404 includes a multiplexer/demultiplexer for (in  
18 the receive mode) extracting separate audio and video  
19 signals from mixed data stream 344 in accordance with ITU  
20 Recommendation H.221. Communication process 404 may  
21 further include a delay compensation process for inducing a  
22 delay in the audio data path in order to maintain lip  
23 synchronization. A system control unit is incorporated  
24 into communication process 404 and is configured to

1 establish a common mode of operation with remote conference  
2 endpoint 102 in accordance with ITU Recommendation H.242.

3 Audio codec 408 receives the audio data stream from  
4 communication process 404 and applies redundancy reduction  
5 decoding in accordance with a standard (e.g., ITU  
6 Recommendation G.711) or proprietary audio compression  
7 algorithm. The decoded audio data stream is then sent to  
8 audio mixing module 308, as described above. Similarly,  
9 video codec 406 receives the video data stream and applies  
10 redundancy reduction decoding in accordance with a standard  
11 (e.g., ITU Recommendation H.261) or proprietary video  
12 compression algorithm. The decoded video data stream is  
13 subsequently sent to video switching/continuous presence  
14 module 306 for combination with video data generated by  
15 remote conference endpoint 104 and near conference endpoint  
16 100, as described above in connection with FIG. 3.

17 In the transmit mode, video codec 406 encodes the  
18 video data stream output by video switching/continuous  
19 presence module 306 (representative, for example, of a  
20 "continuous presence" image) using a standard or  
21 proprietary video compression algorithm (e.g., H.261) and  
22 delivers the encoded video data to communication process  
23 404. Audio codec 408 encodes the audio data stream output  
24 by audio mixing module 308 (representative, for example, of

1 the blended speech of conference participants located at  
2 near conference endpoint 100 and remote conference  
3 endpoints 102 and 104) using a standard or proprietary  
4 audio compression algorithm (e.g., G.711) and delivers the  
5 encoded audio data to communication process 404.

6 Communication process 404 multiplexes the encoded  
7 audio and video data streams into a single audio/video data  
8 stream 344 of relatively high bandwidth. The audio/video  
9 data stream is conveyed to circuit switch 350, which breaks  
10 up and distributes the high-bandwidth audio/video data  
11 signal over plural ISDN channels as further described  
12 hereinbelow.

13 It is noted that, while not depicted in the Figures,  
14 processing train 302 may include a data codec for coding  
15 and encoding still images and the like received from or  
16 transmitted to remote conference endpoints 102 and 104.

17 With reference to FIG. 5 the network interface 224  
18 includes a time division multiplexer 502 which receives the  
19 wideband data stream 226 from the circuit switch 350. The  
20 time division multiplexer 502 is coupled to a plurality of  
21 ISDN ports 504 for receiving and transmitting signals on  
22 lines 240, 242, 244, and 246.

23 The present invention advantageously utilizes  
24 software-based processing of video and audio data streams

1 to implement a multi-point conferencing capability in a  
2 conference endpoint. By dynamically generating a separate  
3 instance of a processing train for each remote endpoint  
4 session, a videoconferencing system embodying the invention  
5 may easily and flexibly accommodate endpoint sessions  
6 comprising a range of connection bandwidths and  
7 communication protocols. Other advantages will occur to  
8 those of ordinary skill upon review of the foregoing  
9 description and the associated figures.

10 It is to be understood that the detailed description  
11 set forth above is provided by way of example only.  
12 Various details of design, implementation or mode of  
13 operation may be modified without departing from the true  
14 spirit and scope of the invention, which is not limited to  
15 the preferred embodiments discussed in the description, but  
16 instead is set forth in the following claims.

## CLAIMS

What is claimed is:

- 1/ 1. A multi-point conferencing apparatus for conducting a  
2 conference with a plurality of remote conference endpoints  
3 linked for communication by a network, the apparatus  
4 comprising:  
5 a multi-point conference application for receiving  
6 audio and video signals from the plurality of remote  
7 conference endpoints, processing the received audio and  
8 video signals, combining the processed audio and video  
9 signals with the local audio and video signals, and  
10 transmitting the combined audio and video signals to each  
11 of the plurality of remote conference endpoints, the multi-  
12 point conference application being configured to create a  
13 plurality of processing trains corresponding to the  
14 plurality of remote conference endpoints, each processing  
15 train processing audio and video signals from a selected  
16 one of the remote conference endpoints.

1 2. The apparatus of claim 1, wherein the multi-point  
2 conference application comprises a circuit switch for  
3 instantiating the plurality of processing trains, the  
4 circuit switch including dynamically allocable inverse  
5 multiplexers.

1 3. The apparatus of claim 1, wherein the multi-point  
2 conference application includes a video switching module  
3 for combining the remote and local video signals, and an  
4 audio mixer for combining the remote and local audio  
5 signals, the video switching module and audio mixer  
6 directing the combined signals as input to each of the  
7 processing trains.

1 4. The apparatus of claim 3, wherein the video switching  
2 module is selectively operable in a continuous presence  
3 mode, wherein images corresponding to each of the plurality  
4 of conference endpoints are displayed in separate areas of  
5 a composite image.

1 5. The apparatus of claim 1, further comprising a  
2 plurality of ISDN ports, each coupleable to an ISDN line,  
3 for receiving and transmitting audio and video signals from  
4 and to the conference endpoints over the network, each  
5 conference endpoint having at least one of the plurality of  
6 ISDN ports corresponding thereto.

1 6. The apparatus of claim 1, wherein each of the  
2 plurality of processing trains comprises a communication  
3 process and a set of codecs.

1 7. The apparatus of claim 6, wherein the communication  
2 process comprises an H.320 communication process.



1 8. A method for conducting a conference between a near  
2 conference endpoint and a plurality of remote conference  
3 endpoints connected for communication by a network,  
4 comprising the steps of:

5 at the near conference endpoint:

6 generating local audio and video signals;

7 receiving audio and video signals from the plurality  
8 of remote conference endpoints;

9 creating a plurality of processing trains for

10 processing the received signals, each processing train

11 uniquely corresponding to one of the plurality of remote  
12 conference endpoints;

13 processing the received audio and video signals;

14 combining the processed audio and video signals with  
15 the local audio and video signals; and

16 transmitting the combined audio and video signals to  
17 each of the plurality of remote conference endpoints.

18 9. The method of claim 8, wherein the step of creating a  
19 plurality of processing trains includes creating a  
20 communication process and a set of codecs.

1 10. The method of claim 8, wherein the step of combining  
2 the processed audio and video signals is performed using an  
3 audio mixer and a video switching module.

4 11. The method of claim 8 further comprising providing a  
5 circuit switch for instantiating the plurality of  
6 processing trains, the circuit switch including dynamically  
7 allocable inverse multiplexers.

8 12. The method of claim 10, wherein the video switching  
9 module is selectively operable in a continuous presence  
10 mode, wherein images corresponding to each of the plurality  
11 of conference endpoints are displayed in separate areas of  
12 a composite image.



1 video signals. The outputs of the audio mixer and video  
2 switching module are sent to each of the plurality of  
3 signal processing trains, which process the combined  
4 signals according to a transmit mode for distribution to  
5 the remote endpoints over the switched network.

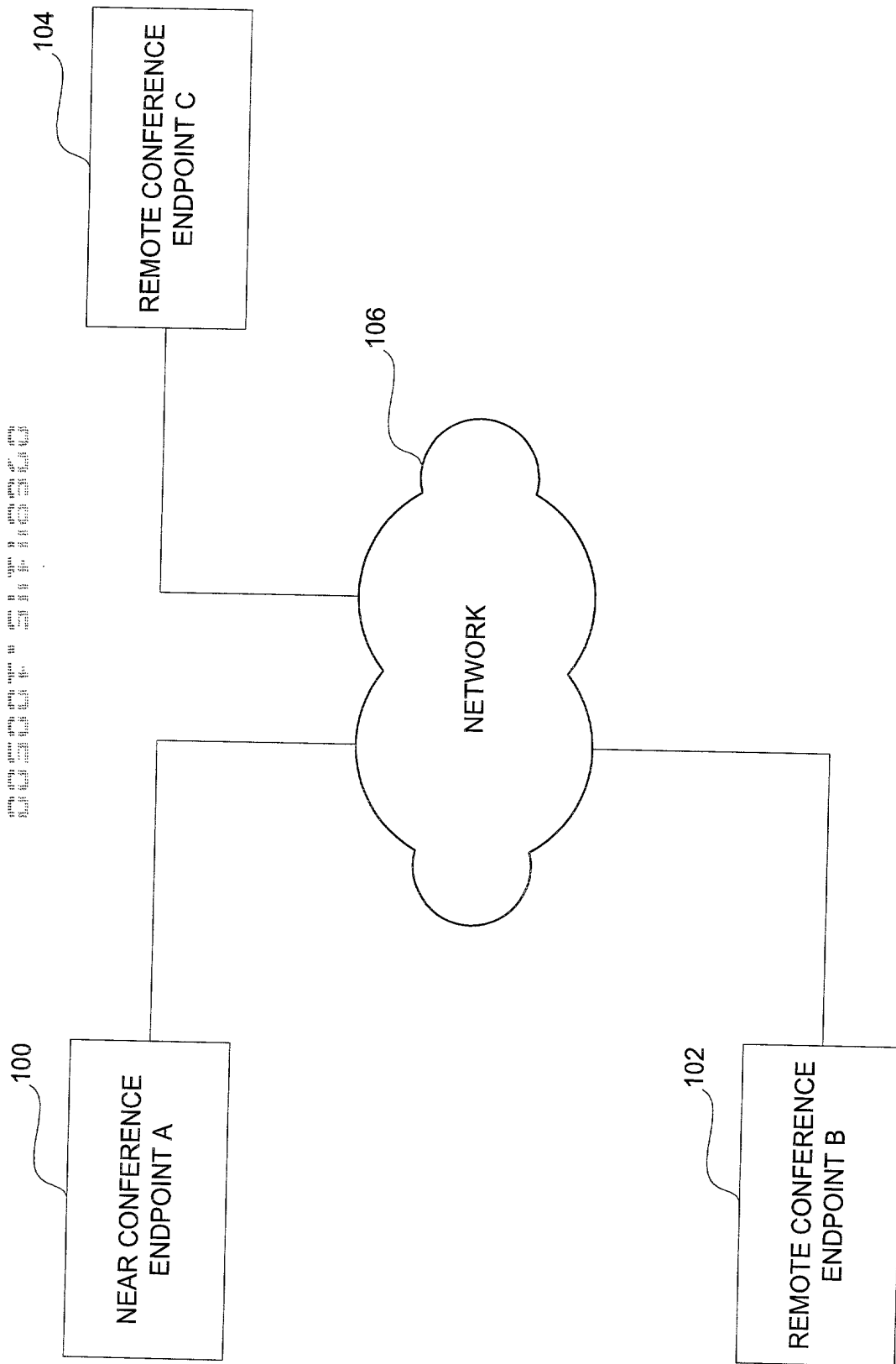


FIG. 1

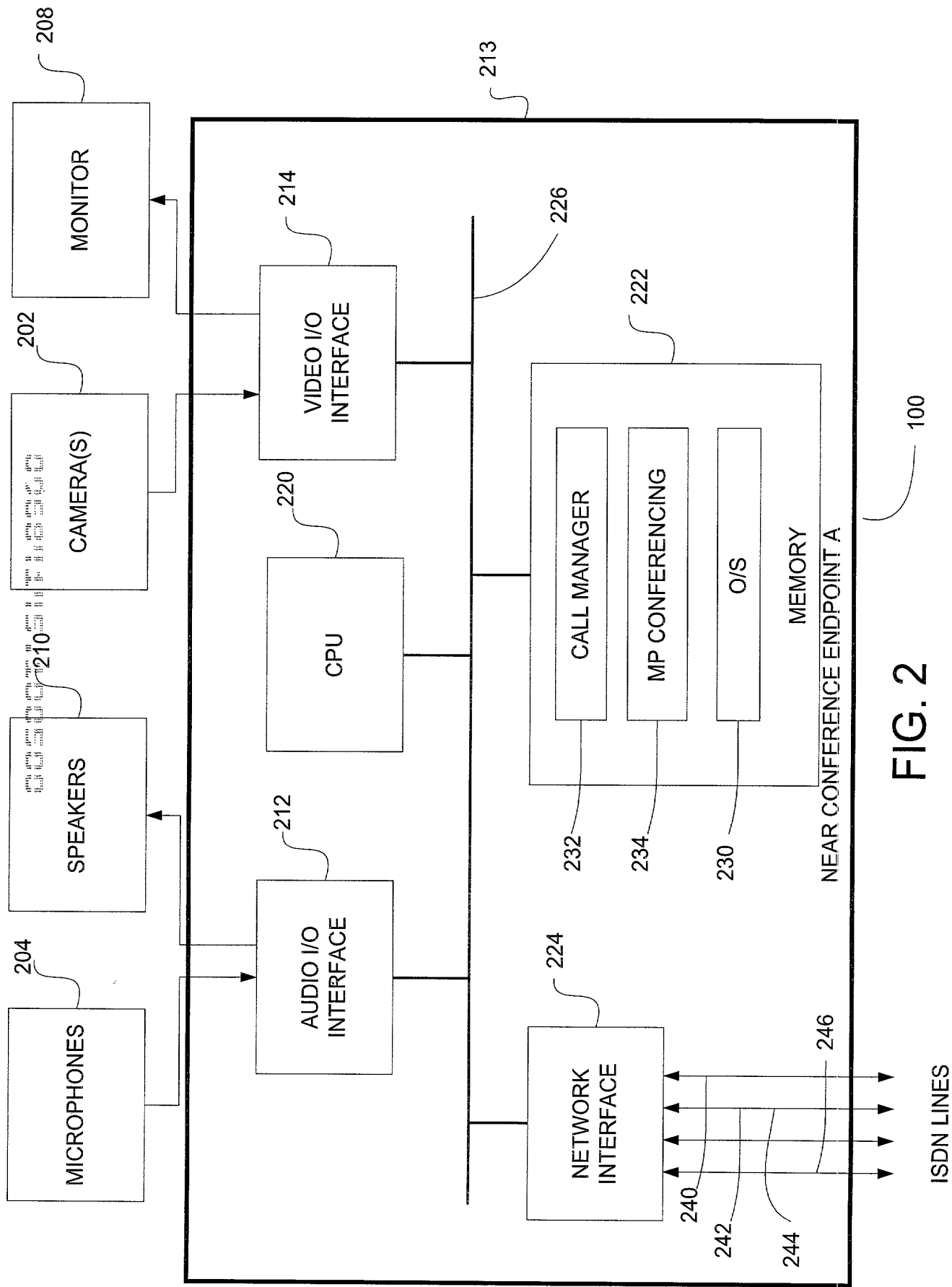


FIG. 2

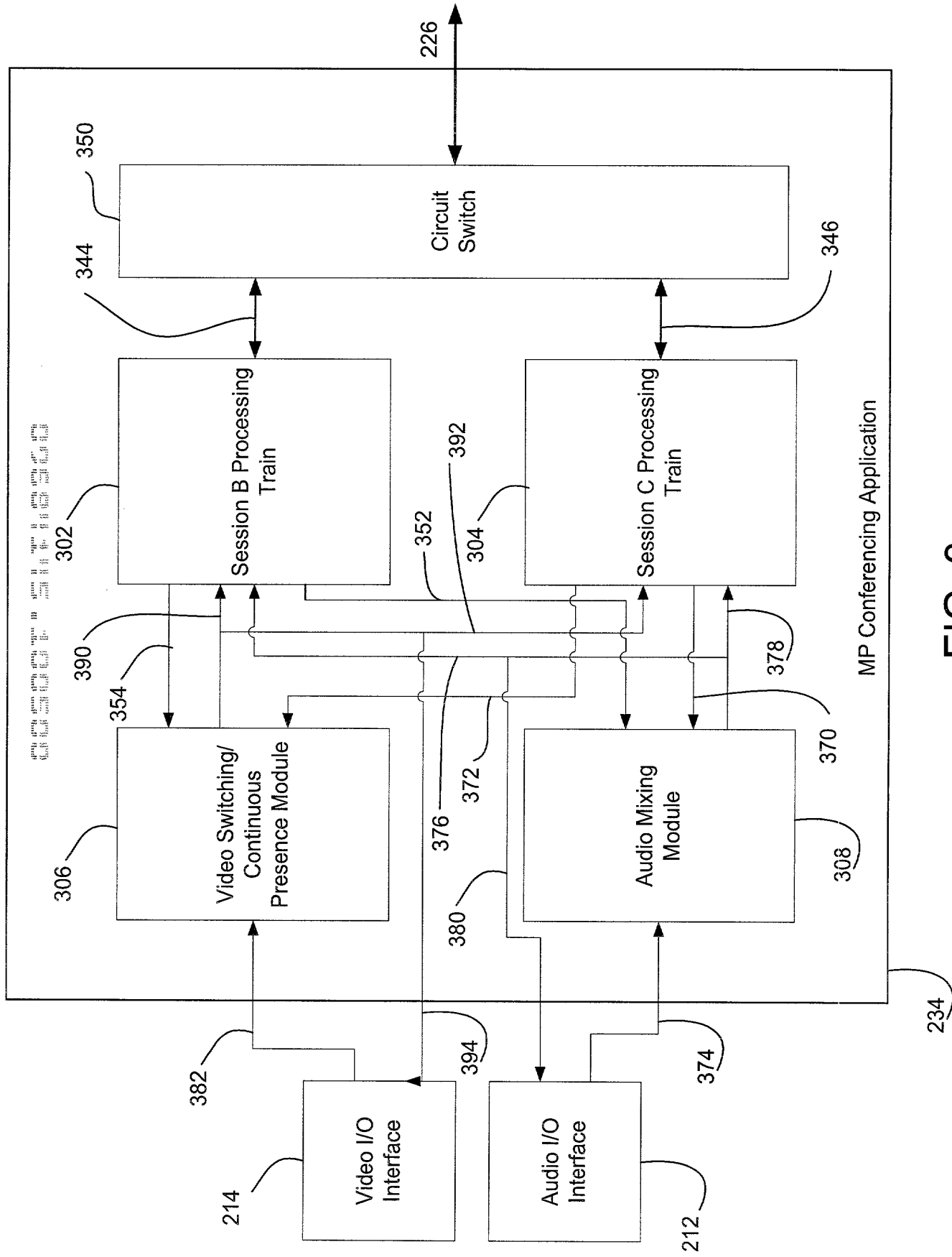


FIG. 3

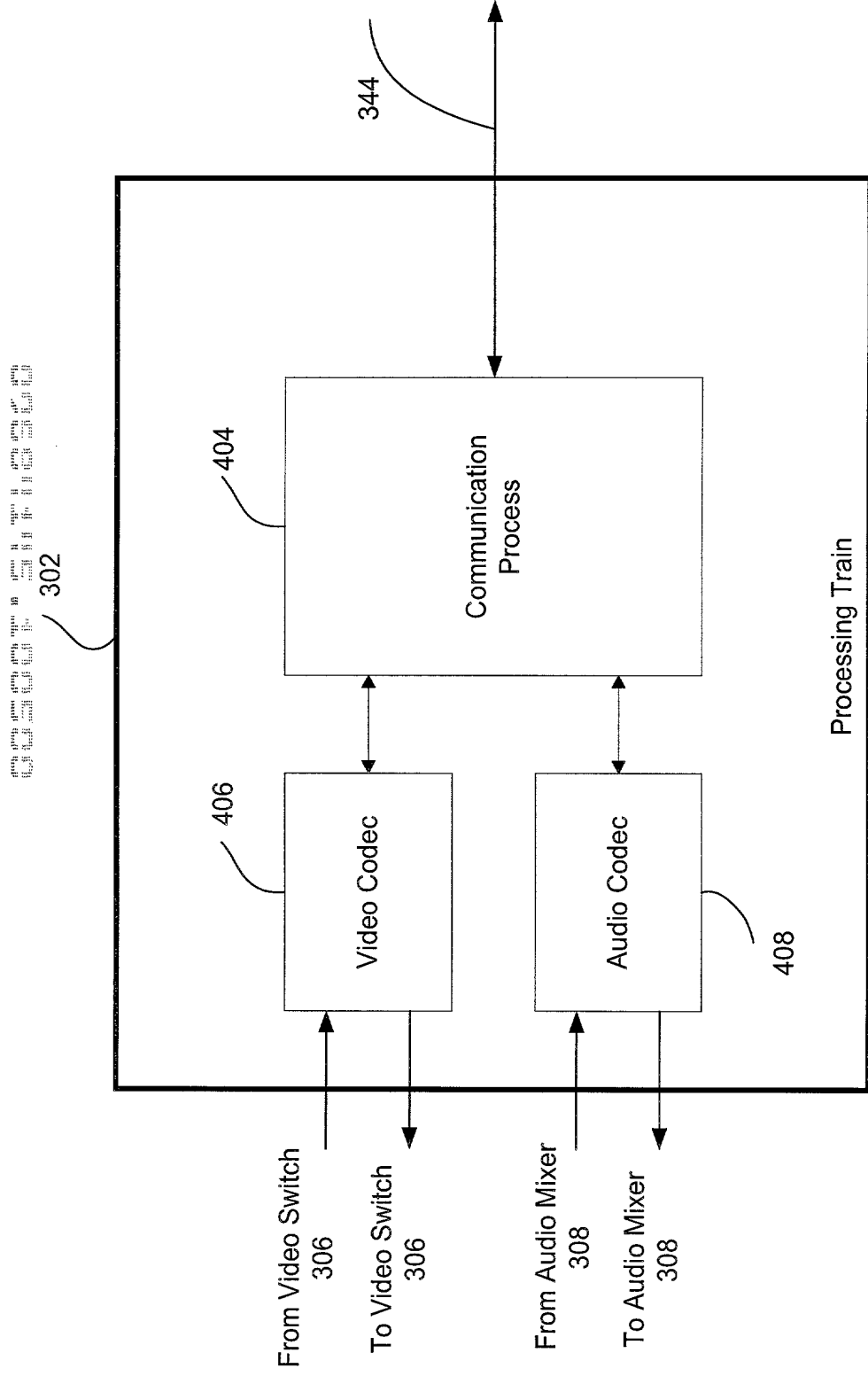


FIG. 4



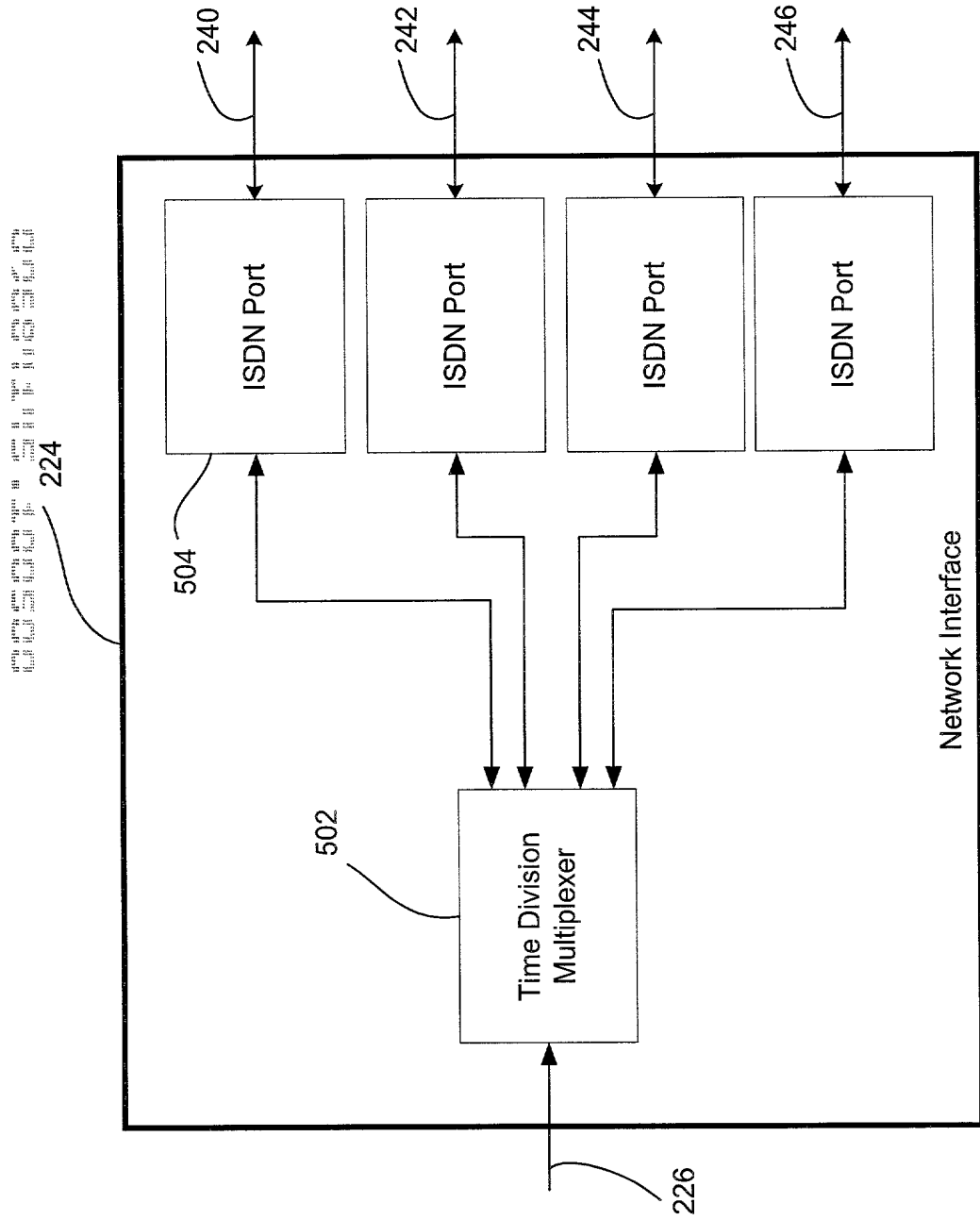


FIG. 5